
Short Course Training in Epidemiology and Biostatistics for Graduate and Undergraduate Public Health Professionals

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Synopsis

The University of South Florida has developed short courses of 2 to 3 days in epidemiology and biostatistics geared to public health workers. A key focus is providing skills which will assist local and State public health units to assess their status and measure progress with respect to achieving their

explicitly stated health objectives for the year 2000. The courses were developed after the identification of the training needs in health departments and other public health settings.

The training objectives were (a) to enhance the biostatistics skills of professionals involved in the analysis of health data; (b) to reinforce basic knowledge of epidemiologic methods and its practical applications in public health settings, including measures of disease frequency and association, epidemic outbreak investigations, and the identification and use of surveillance data; and (c) to demonstrate the application of the risk factor approach to select the interventions needed to reach health objectives for year 2000 and how to evaluate such interventions. A total of 43 students have taken this course series.

Professional staff in health departments cannot always enroll in formal training in epidemiology and biostatistics because of time limitations or a lack of a bachelor's degree. However, the need exists. An alternative to such training could be the short course program described in this paper.

SINCE THE DEMISE of the Applied Statistics Training Institute (ASTI) sponsored by the National Center for Health Statistics (NCHS) (1) more than a decade ago, there has been a dearth of applied statistics training for public health workers in the form of short courses.

Recognizing the need for similar training including epidemiologic methods, NCHS in 1990, funded a 1-year pilot project to develop courses of 2 to 3 days in both biostatistics and epidemiology geared to public health workers at the State and local levels. A key focus is providing skills which will assist public health units to assess their status and measure progress with respect to achieving health objectives for the year 2000 (2).

This cooperative agreement between the Association of Schools of Public Health (ASPH) and NCHS, part of the Centers for Disease Control and Prevention (CDC), is entitled, "Program to Enhance the

Statistical and Epidemiologic Capacity of State and Local Health Professionals" (3). Under this program, the Department of Epidemiology and Biostatistics, College of Public Health, at the University of South Florida (USF), offered three short courses with specific goals, using Florida public health units as a model.

This program was planned to continue only 1 year. However, it served as the pilot for the revival of the ASTI, which is now further developing this short course methodology as an established service. The short courses in epidemiology and biostatistics are oriented to State and local health workers who desire to upgrade their methodological skills in these fundamental areas. An additional emphasis is placed on the use of epidemiologic quantitative concepts and methods to evaluate intervention programs.

The courses were first offered in Tampa, FL. Four neighboring county health units supplied many of the

43 attendees for the first offering and the evaluation of the project courses. The population of the four counties, approximately 2 million, was composed of white and minority populations; only one county was primarily rural. The courses offered during 1990 were thoroughly evaluated and revised accordingly. Good rapport had been established with these nearby counties and with the State health office to assure that the courses meet real needs.

Training Needs

Meetings to define the statistical and epidemiologic training needs of the local health department Health and Rehabilitative Service staff as well as the training levels were conducted. For this purpose, a CDC technical advisor and directors of local health units were interviewed. Based on those meetings, the following conclusions were reached:

- The health department staff in need of training are usually technicians, with no more than high school education and in some cases bachelor's degree in nursing or related fields. A few may be physicians. However, most of them have had no basic training in statistics or epidemiology, or it has been many years since they had such training. At the health district and county level, improvement of skills in statistical descriptive analyses, data presentation, and epidemiologic interpretation of morbidity and mortality rates is urgently needed.

Strengthened competence in the evaluation of surveillance systems was also identified as a priority. The development of adequate surveillance systems and epidemic outbreak investigation are often the major activities of health department staff at this level.

- Planning and evaluation of health programs designed to reach the goals of "health for all in year 2000" (2) are conducted at the State level only. Workers at the local level are responsible for collecting information that will be analyzed at the State or at the central NCHS level in Hyattsville, MD. For those at the central or State level, intermediate stage courses may be more useful. Courses for this level should be directed mostly to health professionals with a medical background or the master's degree in public health training (MPH), or both. These courses may include instruction in epidemiologic methods and statistical tests useful for planning and evaluation of intervention programs.

The courses were designed on two levels. The first or basic level was directed to persons with a

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bachelor's degree (or equivalent because of experience) in a health related field or physicians without a formal training in public health. The intermediate level included health professionals (for example, physicians) with a MPH or equivalent.

Training Objectives

The training objectives were as follows:

- to enhance the biostatistical skills of health professionals involved in the analysis of health statistics;
- to reinforce basic knowledge of epidemiologic methods and its practical applications in public health settings, including measures of disease frequency and association, epidemic outbreak investigations, and the identification and use of sources of surveillance data;
- to review the epidemiologic methods used in planning and evaluation of intervention programs to reach health objectives for year 2000 by the application of the risk factor approach.

Methods

USF faculty taught all courses during the first year. Subsequently, ASTI recruited and trained instructors outside the USF in the use of the teaching materials, within a standardized format. USF faculty were then allowed to evaluate the training program and be ready to develop new courses, as needed, after the first year. The coordinating center was the College of Public Health, USF, in Tampa.

In Tampa, a new teaching laboratory was available with personal computers and the latest audiovisual and computer technology for teaching biostatistics and epidemiology. Courses were limited to 30 students. Course size was, is, and will be limited by classroom size and computer availability.

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were initially developed and refined. More courses will then be added as need develops. Because of time limitations during the first year, only three courses were offered. The first six course titles and a brief description are listed subsequently.

Course 1: descriptive statistics and presentation of data. Descriptive statistics are often given short-shift in courses, but they are essential to public health workers. This course covers basic descriptive statistics and presentation of data. A review of the measurements of disease frequency (counts, ratios, proportions, rates, and rate adjustment) and measures of central tendency and dispersion are also included (4-6). The need for this type of knowledge is great as well as the concomitant demand. This course is designed for basic stage participants and was offered for the first time during 1990 to 13 students.

Course 2: applied biostatistics. It encompasses basic elements of probability, population distributions, statistical inference, selected tests for statistical significance, evaluation of screening and diagnostic procedures, and linear regression and correlation. A key element is the self-instructional, 100-page programmed textbook written by P.E.L. (4). This course is aimed only at intermediate stage trainees—those who are involved in the analysis of health statistics or wish to become more facile at reading the technical literature in public health or both.

Course 3: introductory epidemiology. The basic terminology and principles of epidemiology in the practice of public health are covered with special emphasis on the practical utility of the concepts and methodology. The course content includes measures of disease frequency (counts, ratios, proportions, rates, and rate adjustment) and association (relative

risk, odds ratio, and attributable risks), identification and use of the sources of surveillance data, and review of the major public health rates. The main purposes are (a) to provide a basic knowledge of epidemiology to health professionals, (b) to develop a population-based perspective of the distribution and determinants of disease, and (c) to calculate and interpret measures of disease frequency and association manually and by using personal microcomputers (5-9). This course was offered during 1990 to 15 participants.

Course 4: investigation of disease outbreaks. Modelled after CDC's successful instruction style, a short course on epidemic outbreak investigations or disease clusters was prepared. This course includes a brief review of selected subjects related to infectious diseases, types of epidemics, protocol for an epidemic investigation, attack rates assessment, and the use of case-control studies. Development and analysis of spot maps and epidemic curves are included. Real examples of disease outbreaks are used. The EPIINFO PC free-ware developed by the World Health Organization and CDC for data processing, analysis, and reporting is a major focus (7,8,10). This course is intended for participants at any stage of their career.

Course 5: health objectives for the year 2000. Activities toward setting, monitoring, and achieving the objectives for the year 2000 create a renewed urgency about continuing education in statistics and epidemiology. The Institute of Medicine's report, "The Future of Public Health" in the United States highlights these needs as paramount in enhancing the capacity of the nation for meeting the public health requirements of the future (2).

This course includes a detailed discussion of the most relevant objectives and tasks to be achieved by year 2000 (2). A review of the sources of data and assessment of health indicators, including measures of disease frequency, association, and some statistical procedures, is also addressed. As a consequence, the course presents a full demonstration of the usefulness of selected epidemiologic and statistical tools (5,11). This course is intended for intermediate stage participants and was offered during 1990 to 14 students.

Course 6: epidemiologic planning and evaluation of intervention programs. The planning and evaluation of intervention programs ideally need to be complemented by the study of risk factors. Success of interventions should also be assessed by the reduction

or elimination of these factors. Morbidity and mortality rates as well as measurements of association of relevant risk factors in the population are needed to evaluate the impact of the intervention in the health status.

This course includes a review of the use of measures of association, their confidence limits, and the statistical tests to assess the significance of the associations. A solid introduction to these subjects has been incorporated in this course, which is intended only for intermediate stage participants who are in the decision making process regarding health care planning and evaluation (2,5,8,11-13).

Course Evaluation

Evaluation was carried out by a specific questionnaire administered to all participants, and the results were compared with the course objectives. Areas evaluated were organization, format, contents, and level of difficulty of the courses. An assessment of their contribution to the participant's health professional career goals and educational background was emphasized. The adequacy of textbooks and reading materials was rated. The evaluation also focused on the teaching abilities of the instructors.

This evaluation was conducted immediately after the course and again 6 months later. The second evaluation emphasized the usefulness of the training in the specific tasks of the trainee. At that time, a simple evaluation form was also given to the trainee's supervisor to collect information about improvements in the performance of the trainee's tasks in the previous 6 months.

During both evaluation surveys, suggestions were solicited from trainees on ways to improve the courses. A computerized optical scan technique, for data processing of the evaluation forms, in use at the College of Public Health was adapted for these courses. This tool will be useful only for larger classes or simultaneous course evaluations in future years.

Most of the course evaluation items are based on a five-level scale (for example, much above average, above average, average, below average, much below average). Course success was primarily based upon how well a course met the trainees' expectations. A course was considered successful if more than two-thirds agree that it at least met expectations. Of course, higher percentages (100 percent) was the goal for each.

A major revision was undertaken only if more than 30 percent of the trainees considered an item or a course below or much below average. All comments

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and suggestions were considered for further discussion during interviews. To consider revisions based on this somewhat more subjective form of evaluation, a unanimous vote from the three primary instructors was necessary.

Followup interviews with trainees' supervisors and other health officers are carried out every year to determine new priority training needs. All the data gathered from interviews and course evaluation forms were used to revise the teaching techniques, course materials, course contents, course scheduling, use of examples, exercises, and computer software. During the interviews and evaluations made by trainees' supervisors, information was also obtained about potential sources for further course funding and an estimation of potential future charges, including tuition and fees.

Results

Course participants. Participants included physicians, nurses, and other health-related professionals already working in health departments without formal training in public health. About one-half of them already occupied managerial positions or coordinated specific health programs. Most of them had a bachelor's degree.

Course evaluations. A number of participants found a certain degree of difficulty in understanding medical and statistical terminology. Fortunately the course goals were reached. The majority of participants found the courses useful and easy to apply in their own field. The use of computers was welcome, and the only complaint was the reduced time and small number of exercises. Participants also expressed increased interest in having more short courses available to continue their training in the future.

A total of 43 participants have taken the annual course series: 14 of them, the introductory course in

biostatistics; 15 participants, the introductory course in epidemiology; and 14, the course of health objectives for the year 2000. USF instructors are now involved as part of the faculty body of the ASTI Program and sometimes courses are taught in Tampa.

Conclusions

The purpose of this project was to develop a standardized short training course to be aimed at highly selected audiences in need of continuing education. However, this continuing education is being tailored according to the specific needs identified by the selected professionals and may not be necessarily useful for other audiences.

Because of time limitations or a lack of a bachelor's degree, a health professional working in a health department cannot always enroll in lengthy training in epidemiology and biostatistics, such as a master's or a doctoral degree in public health. However, the need exists. An alternative to formal training could be short course training such as that described in this paper. These courses have the advantages of focusing on very practical applications and do not require long-term attendance. However, they may not be adequate for other types of health professionals, such as those working in clinical settings.

Short courses constitute an important training alternative, but they are not intended as substitutes for formal training offered in schools of public health. A greater diversity of short courses will then be developed for different audiences, such as clinicians. Short training for clinicians, for example, will concentrate more on evaluation of diagnostic procedures, clinical research design, research methods for the development and evaluation of clinical trials, data analysis, and determination of sample size in clinical research (4-6,8,11).

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